Lobster Research Project

Maine Department of Marine Resources

Size at First Sexual Maturity for Male and Female Lobsters Found Along the Maine C

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Lobster Informational Leaflet #2

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Abstract

From 1968 through 1970 the Lobster Research Project has investigated the size of first sexual maturity for male and female lobsters. Based on the results of our study, we have concluded that: (1) 50% of the male lobsters mature at about 1-3/4 inches back length, while most males are mature at sizes larger than 2-1/4 inches; (2) females rarely mature at sizes under 3-3/16 inches (gauge measure); (3) a small percentage of females mature between 3-1/8 to 3-1/2 inches back length; and (4) almost all females larger than 3-7/8 inches are mature. Thus it is readily apparent that the present gauge measure of 3-3/16 inches does not allow an adequate number of females to bear seed before being harvested by the commercial fishery

Before a commercial fishery like the lobster fishery can be effectively managed, it is necessary to have scientific knowledge on the fishery and species to be managed. The first leaflet of this series acquainted the reader with the Lobster Project's survey of the commercial lobster fishery along the Maine coast and some of the information obtained from sampling. In this present report we would like to familiarize you with the results of our lobster maturity study Most of the lobsters used in this investigation were collected from 1968 through 1970 by project personnel fishing from a 17-foot Boston Whaler with wire and wooden lobster traps. SCUBA divers were used on a few occasions to collect small male lobsters which were not caught in sufficient numbers by our traps for the purposes of this study

The determination of male maturity was based on 204 lobsters which ranged in back length (hereafter referred to as carapace length) from 1-3/8 to 3-11/16 inches (36 to 95 mm)[1]. Lobsters with sperm in their sex organs were considered to be mature. Figure 1 is a picture of a lobster sperm cell (many, many times smaller than the pointed tip of a hat pin) photographed through a microscope. We first attempted to withdraw sperm through a blunt hypodermic needle inserted into the sex duct opening located on the last pair of walking legs. Since this method produced poor results, a new procedure had to be found We then discovered that the sex organ could be removed, without killing

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[1]To convert inches to millimeters multiply inches by 25.4 or to change millimeters to inches divide millimeters by 25.4 (1 inch = 25.4 mm).

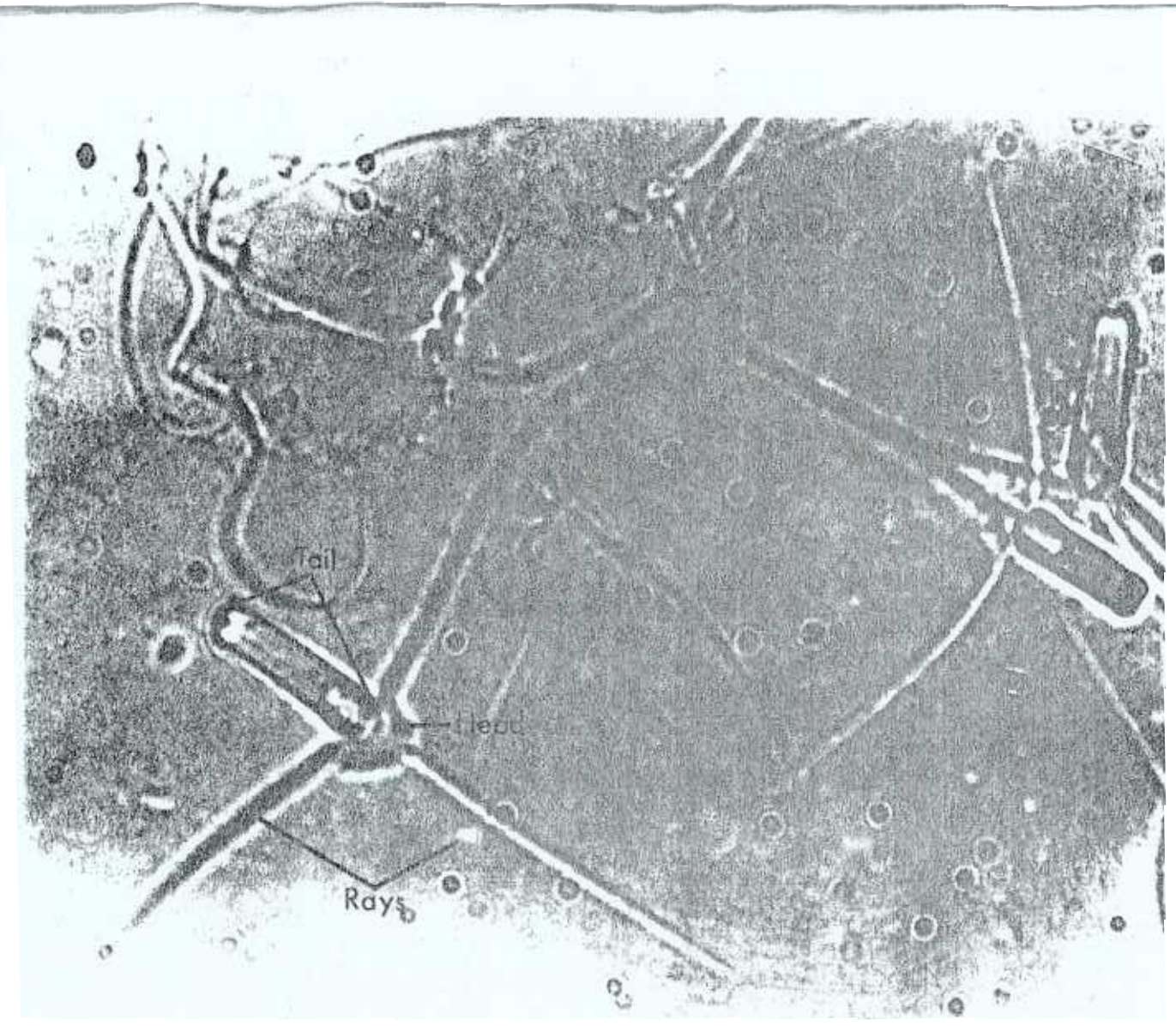


Figure 1. - Photograph of lobster sperm cell.

the lobster, with a forceps through a smal incision at the base of the last pair of walking legs. Figure 2 illustrates the so-called "sex organ" of a male lobster and its parts This organ is paired, thus Figure 2 shows only half of the reproductive system of a normal male lobster

After the examination of sex organs from 204 lobsters for sperm ncluded that approximately half of the male lobsters mature at 1-11/16 inches (44 mm) carapace length (Figure 3) Male lobsters larger than 2-3/16 inches (55 mm) are almost all mature It should be noted that even though Maine males appear mature at relatively small sizes, it is doubtful whether or not male lobsters smaller than the minimum legal size (3-3/16 inches, 81 mm) mate with legal-sized females This conclusion is based upon mating experiments of a Canadian researcher which indicate that male lobsters are physically unable to mate successfully with larger females, and upon our findings, to be presented in the following section, which demonstrate that very few female lobsters mature below the gauge measure

Since the determination of sexual maturity for females is more complicated than that just described for males, we found it necessary to look at female maturity with four independent approaches These approaches and their respective results are as follows

Ovaries (egg producing organs) were removed from 158 female lobsters and then the size and color of the eggs were noted Based on egg size and color, ovaries were

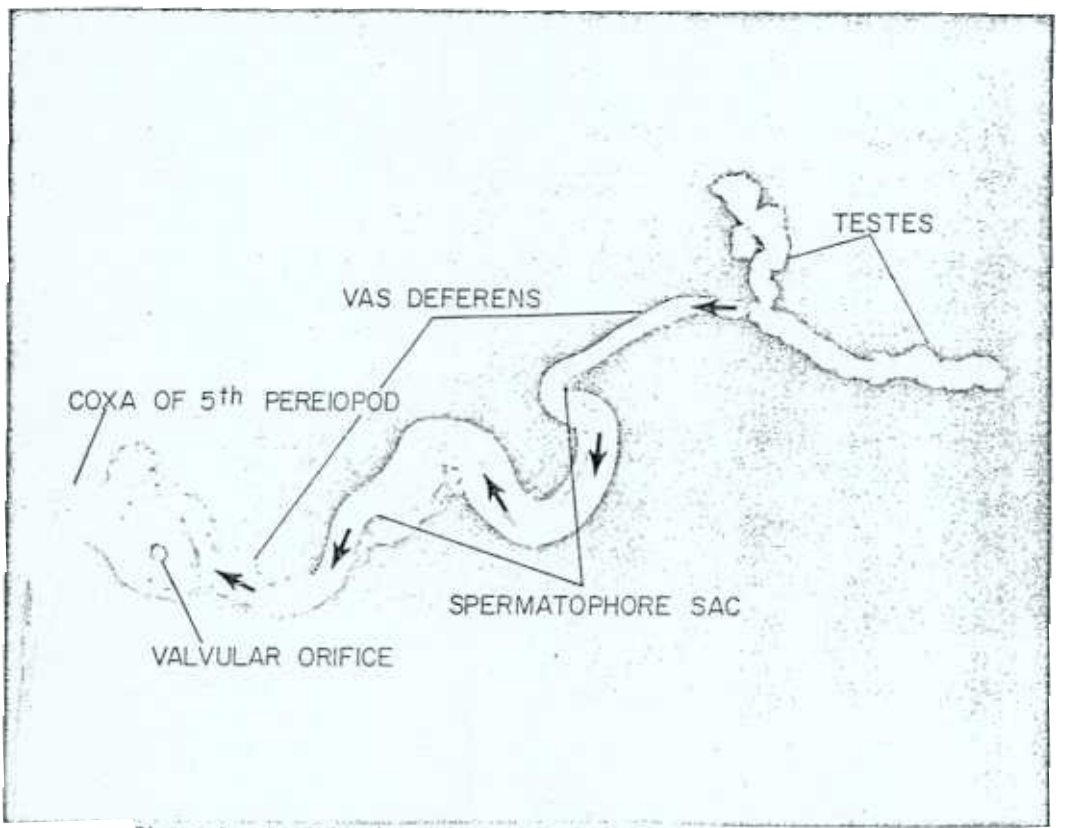


Figure 2. Reproductive system dissected from a male lobster. Arrows indicate movement of sperm from their place of origin in testes to the valvular orifice where they are secreted at the time of mating.

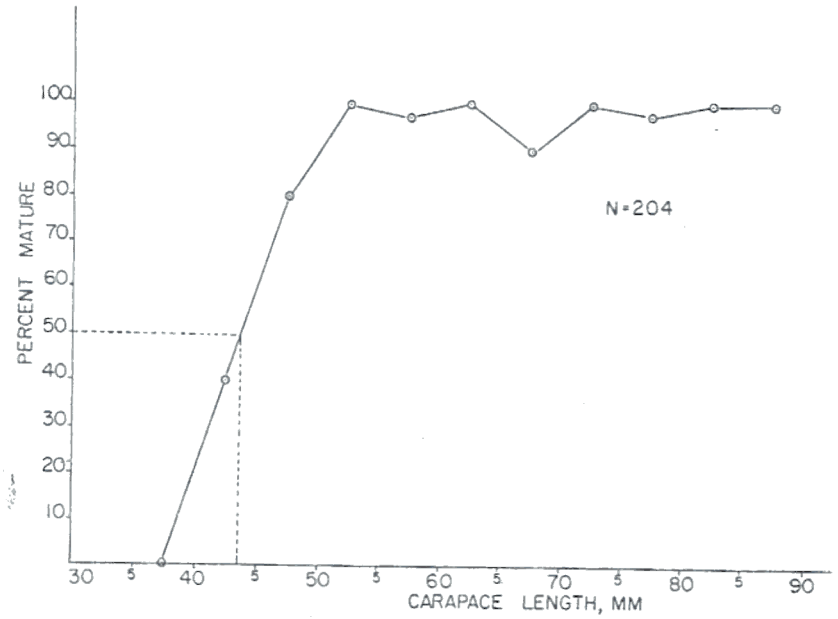
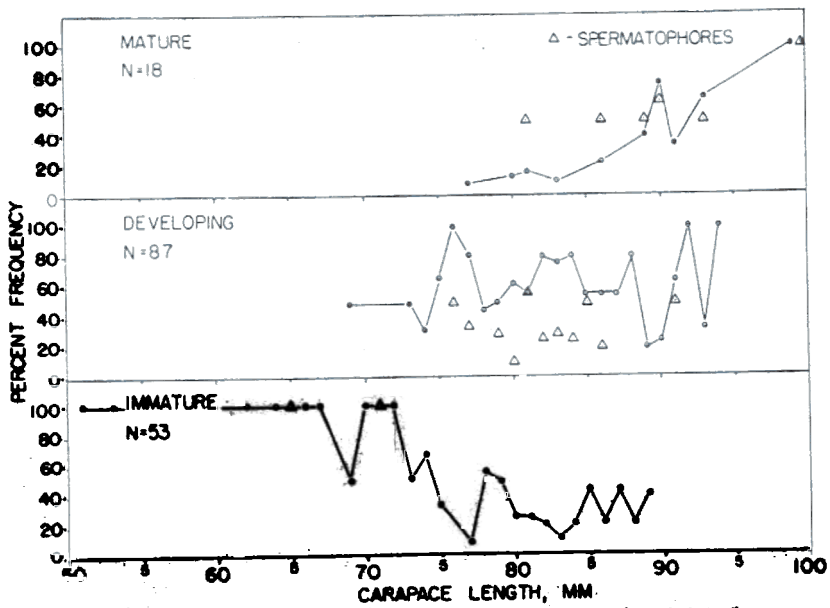


Fig. 3. - Percentage frequency of mature male lobster [illegible] 5-mm size classes.

classified in one of three categories: immature, developing, or mature. The percentage of females by size in each of the above categories is plotted in Figure 4. Figure 4 reveals that a few females mature between 3-1/8 and 3-1/2 inches (80 to 90 mm) carapace length, while most females assume motherhood at sizes above 3-1/2 inches (90 mm).

(2) Widths of the underside of the second fan-tail segment of 482 females were measured and compared to their carapace lengths. As female lobsters near maturity and become mature the fan-tail section rapidly increases in width, thus providing a larger surface area for seed attachment. Knowing this, we compared the ratio of fan-tail or abdominal width to carapace length (divide fan-tail width by carapace length) with carapace length in Figure 5. If we look at the curve for Boothbay Harbor (Krouse), we'll see a change in direction of the curve at about 3-1/8 inches (80 mm). This direction change is caused by an accelerated increase in fan-tail width; therefore, 3-1/8 inches (80 mm) is interpreted as the size where lobsters begin to mature. From the curves labelled offshore (Skud and Perkins) and Boothbay Harbor (Perkins), we can see that these curves level off at about 3-7/8 inches (100 mm), indicating that nearly all females are mature at this size.

(3) Seminal receptacles (sperm sack located between the third



[illegible] - [illegible] frequency of the three ovarian stages of development and the occurrence of sperm (triangles) in the seminal receptacle.

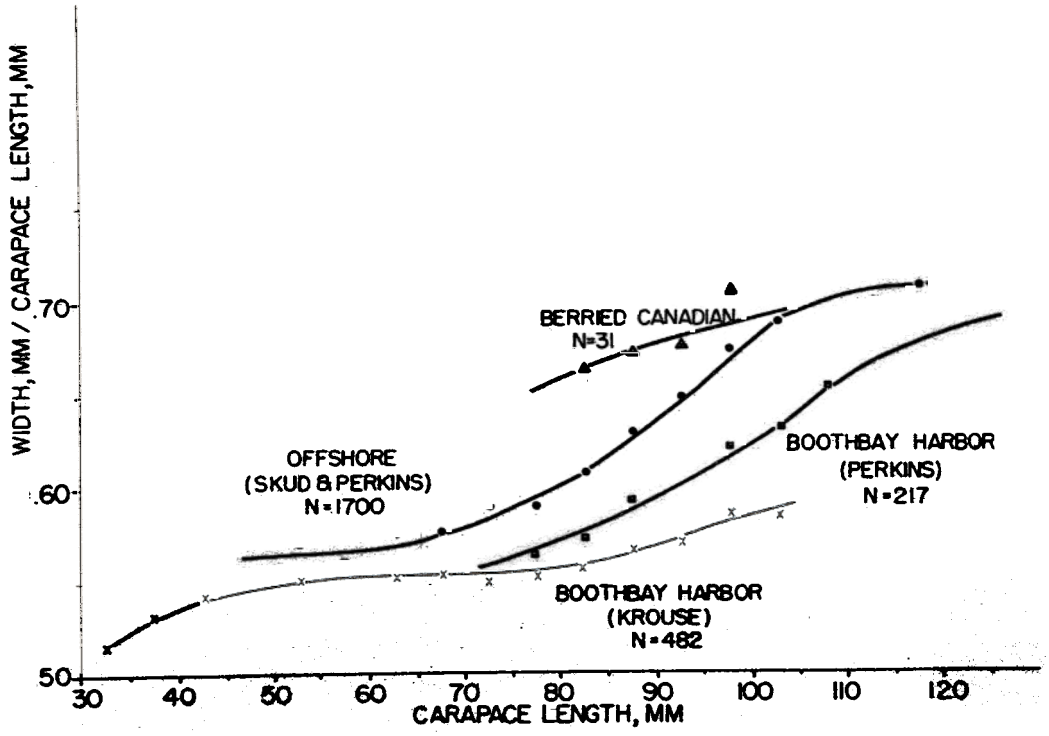


Figure 5. Ratio of abdominal width to carapace length plotted against carapace length.

and fourth pairs of walking legs, where sperm is stored upon mating until female produces seed) were checked for the presence or absence of sperm. Since females only mate (receive sperm) while they're shedders, hard-shelled females without sperm in their sacks, no matter how developed their seed, would not be able to hatch eggs unti they underwent another molt and then mated. Looking back once again to Figure 4, our data shows that sperm appear most frequently in sacks of mature females, particularly those females larger than 3-1/2 inches (90 mm) carapace length Whereas, females with immature eggs rarely had sperm.

(4) The number and size of native Maine berried females purchased annually by the State were analyzed. The percentage frequency of each size is plotted against carapace length in Figure 6. This graph indicates that of the 1,150 berried females measured only 11% of this number fell between 3-5/16 to 3-1/2 inches (83 to 90 mm) while about 80% of the commercial catch fell in this range. Most of the berried females were larger than 3-7/8 inches (100 mm). Similar to the other segments of this overall study, the berried female information suggests that a few females mature between 3-1/8 to 3-1/2 inches (80 to 90 mm), while above 3-7/8 inches (100 mm) most females are mature

In view of these results of the female maturity investigation, we

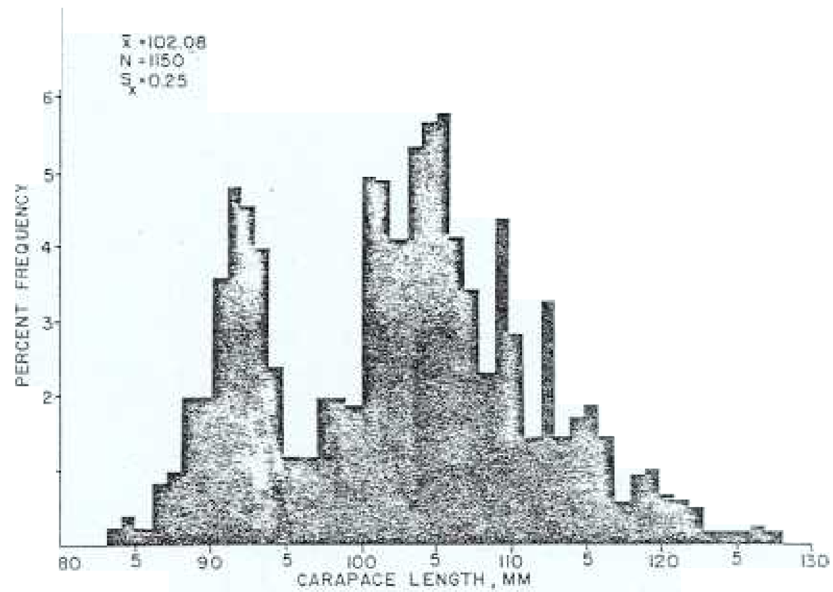


Figure [illegible]. - [illegible]-frequency distribution of native Maine [illegible] females.

have concluded that: (1) females seldom mature below 3-3/16 inches (gauge measure); (2) a few females mature between 3-1/8 to 3-1/2 inches (80 to 90 mm); and (3) at sizes larger than 3-7/8 inches 100 mm) nearly all females are mature.

Maine's minimum size limit of 3-3/16 inches (81 mm) is obviously not allowing most female lobsters the opportunity of spawning at least once before being harvested. This fishery, in order to thrive, must have the insurance that a least a fair number of female lobsters wi mature, produce seed, and subsequently replenish the lobster stock

Thank you for your time and interest in reading this report